## WE CLAIM:

1. A cloned bacterial organophosphorus acid anhydrase gene fragment comprising the DNA coding sequence:

CTGCAGCCTGACTCGGCACCAGTCCTGCAAGCAGGTGGTAAGCAATCGCAAGGGGGGCAGCATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTG CTC GGC get gin thr arg arg val val leu lys ser ala ala ala gly thr leu leu gly GGC CTG GGT GGG TGC GGG AGG TGG GTG GAT CGA TGG GGA CAG GGG ATC GGA TCA gly leu ala gly cys ala thr try leu asp arg ser ala glm ala ile gly ser ATA COT GCS COT COT ATC ACA ATC TOT GAA GCS GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly pne thr leu thr his glu GAC ATC TGC GGC AGC TCG GCA GGA TTC TTG CGT GCT TGC CCA GAG TTC TTC GGT asp ile cys gly ser ser ala gly pne leu arg ala yrp pro glu phe pne gly AGC CGC AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala val arg gyy leu arg ala arg ala ala GGC GTG CGA ACG ATT GTC GAT GTC TCG ACT TTC GAT ATC GGT CGC GAC GTC AGT GTV val arg thr ile val asb val set the pine asp ile gly arg asp val set that TTG GCC GAG GTT TCG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGC leu leu ala glu val set arg ala ala asb val his ile val ala ala thr gly TTG TGG TTC GAC CGG CCA CTT TCG ATG GAA TTG AGG TAT GTA GAG GAA CTC ACA leu trp pine asp pro pro leu set met arg leu arg tyr val glu glu leu thr CAG TTC TTC CTG GGT GAC ATT CAA TXT GGC ATC GAA GAC ACC GGA ATT AGG GCG glin pine pine leu arg glu ile glin ryr gly ile glu asp thr gly ile arg ala GGC ATT ATC AAG GTC GCS ACC ACA GGC AAG GCS ACC CCC TTT CAG GAG TTA GTG gly ile ile lys val ala thr thr gly lys ala thr pro phe gln glu leu val TTA AND GOO GOO GOO GOO AGO TTG GOO ACC GOT GTT GOO GTA ACC ACT CAC law lys ala ala ala ary ala ser law ala thr gly val pro val thr thr his ACC SCA SCA AST CAS COC CAT GOT GAG COA GGC AGG CCA TITT TTG AGT CCG ANG CTT GAG CCC TCA CCG GTT TGT ATT GGT GAC AGC GAT GAT ACT GAC GAT TTG lys lau glu pro ser arg val cys ile gly his ser asp asp thr asp asp lau AGO TAT CTC ACC GGC CTG CTG CGC GGA TAC CTC ATC GGT CTA GAC CAC ATC GGS ser tyr leu thr 34a leu leu arg gly tyr leu ile gly leu asp his ile pro CAC AGT GGG ATT GGT GTA GAA GAT AAT GGG AGT GGA TCA GGG GTG GGG ATG his ser ala ije gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT TOG TOG CAA ACA COG GOT CTO TTG ATO AAG GOG CTO ATO GAO CAA GGC TAC arg ser trp gin the arg ala leu leu ile lys ala leu ile asp gin giy tye ATG AAA CAA ATG CTC GTT TCG AAT GAC TGG CTG TTC GGG TTT TCG AGC TAT GTC Det lys gin ile leu val ser asn asp trp leu phe gly phe ser ser tyr val ACC AÁC ATC ATG GAC GTG ATG GAT GGC GTG AAC GCC GAC GGG ATG GGC TTC ATT thr asn ile met asp val met asp arg val asn pro asp gly met ala phe ile CCÁ CTO AGA GTG ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro lau arg val ila pro pna tyr glu arg arg ala ser his arg lys arg cys gin ala ser leu
CTAACCCGGGGGGGTCTGGTCACCGACTTGCCTTGCATGACGCATCTGGATCCTTCCACGAGCGGCC
ACTATTCCCCCTCAAGATACCGAACGATGAAGTCGGCATCGATAGGCATCTTCAATGTGATCAGGG
CTGCCACCTCCAAAGCCGTGGCCACCCCTGTCGATAGTCATGAGCGACGGTAGCGACGTGGTTTC

2. The gene fragment of claim 1 wherein said fragment is substantially free of extraneous DNA.

- 3. The gene fragment of claim 1 where the DNA is plasmid DNA.
- 10 4. The gene fragment of claim 1 where the source of the DNA is bacteria of the genus <u>Flavobacterium</u>.
- 5. The gene fragment of claim 1 where the source of the 15 DNA is bacteria of the genus <u>Pseudomonas</u>.

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6. An expression vector for producing bacterial organophosphorous acid anhydrase, said vector comprising a cloned bacterial organophosphorus acid anhydrase gene fragment having the DNA coding sequence:

CTGCAGCCTGACTCGGCACCAGTCGCTGCAAGCAGAGTCGTAAGCAATCGCATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT, met gin thr arg arg val val leu lys ser ala ala ala gly thr GGC CTS GCT GGG TGC GCG ACG TGG CTG GAT CGA TCG GCA CAG CCG ATC GGA TCA gly leu ala gly cys ala thr trp leu asp arg ser ala gly ala ile gly ser ATA COT GCG COT CCT ATC ACA ATC TOT GAA GCG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly phe thr leu thr his glu GAC ATC TSC GGC AGC TCS GCA GGA TTC TTG CGT GCT TGG CCA GAG TTC TTC GGT asp ile cys gly ser ser ala gly phe leu arg ala ttp pro glu phe phe gly AGC CGC AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala val arg gly leu arg ala arg ala ala GGC GTG CGA ACG ATT GTC GAT GTG TCG ACT TTG GAT ATC GGT CGC GAC GTC AGT gly val arg thr ile val asp val ser thr pie asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG GGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGG lau lau ala glu val ser arg ala ala asp val his ile val ala ala thr giy THE THE THE GAC COS COA CTT TOS ATS COA THE AGG TAT STA GAG GAA CTC ACA CAG TTC TTC CTG CGT GAG ATT CAA PAT/GGC ATC GAA GAC ACC GGA ATT AGG GCG gin phe phe leu arg glu ile gin fyr gly ile glu asp thr gly ile arg ala GGC ATT ATC ANG GTC GCC ACC ACA SGC ANG GCS ACC CCC TTT CAG GAG TTA GTG gly ile ile lys val ala the par gly lys ala the pro pae gla glu leu val TTA AAG GCS GCC GCC CGG GCC AGC TT4 GCC ACC GGT GT7 CCG GTA ACC ACT CAC law lys ala ala arg ava ser law ala thr gly val pro val thr thr his ACC GCA GCA AGT CAG CGC GCA GGT AGG CGA GCC ACC TT7 TTG AGT CCG Chr ala ala ser gin arg asp gly glw arg gly arg pro pro phe lew ser pro ANG CTT GAG CCC TCA 2GG GTT TGT ATT GGT CAC AGG GAT GAT ACT GAC GAT TTG lys lau glu pro ser/arg val cys ile gly his ser asp asp thr asp asp leu AGE TAT OTTO AGE GRE CTG CTG CGC GGA TAC CTC ATC GGT CTA GAC CAC ATC CGG ser tyr leu thr Ala leu leu arg gly tyr leu ile gly leu asp his ile pro CAC AGT GGG ATT GGT CTA GAA GAT AAT GGG AGT GGA TCA CGG CTG CTG GGG ATG his ser ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT TOG TOG/CAA ACA COG GOT CTC TTG ATC AAG GOG CTC ATC GAC CAA GGC TAC arg ser tro gin thr arg ala leu leu ile lys ala leu ile asp gin gly tyr ATG AAA CAA ATG GTG GTT TGG AAT GAC TGG CTG TTG GGG TTT TGG AGG TAT GTG met lys/gin ile leu val ser asn asp trp leu phe gly phe ser ser tyr val ace sac ate ate gae ete ate gat een ete aan een een ean een ean ees ate een tie att thr/asm ile met asp val met asp arq val asm pro asp gly met ala phe ile cra crs aga grg are coa tre tae gag aga agg geg tee cae agg aaa ege fee pro leu arg val ile pro phe tyr glu arg arg ala ser his arg lys arg cys CAG GCA TCA CTG TGA 

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- 7. The expression vector of claim 6 further comprising a promoter, a start codon, and a recombinant DNA sequence coding for bacterial organophosphorus acid anhydrase in accurate reading frame sequence with said start codon for translation.
- 8. The expression vector of claim wherein said vector 10 is derived from a bacylovirus.
  - 9. The expression vector of claim 7 wherein said vector is a bacteriophage.

10. The expression vector of claim 7 wherein said vector is a plasmid.

11. The expression vector of claim 10 wherein said plasmid comprises a transposon capable of transposing the drosophila genome.

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12. A transformed microorganism comprising an expression vector for producing bacterial organophosphorus acid anhydrase wherein said vector has a cloned bacterial organophosphorus acid anhydrase gene fragment with the DNA coding sequence:

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CTGCAGCCTGACTCGGGACCAGTCGCTGCAAGCAGTCGTAAGCAAT¢GCAAGGGGGCAGC ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTG CTC GGC met gin thr arg arg val val leu lys ser ala ala gly thr leu leu gly GGC CTG GCT GGG TGC GCG ACG TGG CTG GAT CGA TCG GCA ACG GCG ATC GGA TCA gly leu ala gly cys ala thr trp leu asp arg ser ala gln ala ile gly ser ATA CGT GCG CGT CCT ATC ACA ATC TCT GAA GCG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly phe thr leu thr his glu GAC ATC TGC GGC AGC TCG GCA GGA TTC TTG CGT TCG CCA GAG TTC TTC GGT asp ile cys gly ser ser ala gly phe leu arg ala trp pro glu phe phe gly AGC CGC AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala val arg gly leu arg ala arg ala ala GGC STG CGA ACG ATT GTC GAT GTG TCG ACT TTC GAT ATC GGT CGC GAC STC AGT gly val arg thr ile val asp val ser thr phe asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGC leu leu ala glu val ser arg ala ala asp val his ile val ala ala thr gly TTG TGG TTC GAC CCG CCA CTT TCG ATG CGA TTG AGG TAT GTA GAG GAA CTC ACA leu trp pne asp pro pro leu ser met arg leu arg tyr val glu glu leu thr CAG TTC TTC CTG CGT GAG ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCG gln phe phe leu arg glu ile gin tyr gly ile giu asp thr gly ile arg ala GGC ATT ATC AAG GTC GZG ACC ACA GGC AAG GCG ACC CCC TTT CAG GAG TTA GTG gly ile ile lys val ala thr thr gly lys ala thr pro phe gln glu leu val TTA AAG GCG GCC GGC GCC AGC TTG GCC ACC GGT GTT CCG GTA ACC ACT CAC leu lys ala ala ala ara ala ser leu ala thr gly val pro val thr thr his ACS GCA GCA AGT CAG CGC GAT GGT GAG CGA GGC AGG CCA TTT TTG AGT CCG ANG CTT GAG CCC TOA CGG GTT TGT ATT GGT CAC AGG GAT GAT ACT GAG GAT TTG lys lau g/u pro ser arg val dys ile gly his ser asp asp thr asp asp lau CTC ACC GCC CTG CTG CGC GGA TAC CTC ATC GGT CTA GAC CAC ATC CCG AGT GCG ATT GGT CTA GAA GAT AAT GCG AGT GCA TCA CCG CTC CTG GGC ATC ser ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT TOG TGG CAA ACA CGG GCT CTC TTG ATC AAG GCG CTC ATC GAC CAA GGC TAC arg ser trp gln thr arg ala leu leu ile lys ala leu ile asp gln gly tyr ATG AAA CAA ATC CTC GTT TCG AAT GAC TGG CTG TTC GGG TTT TCG AGC TAT GTC det lys glm ile leu val ser asm asp trp leu phe gly phe ser ser tyr val ACC AAC ATC ATG GAC GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp val met asp arg val asn pro asp gly met ala phe ile CCA CTG AGA GTG ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ile pro phe tyr glu arg arg ala ser his arg lys arg cys  $\frac{1}{2}$ CAG GCA TCA CTG TGA 

13. The transformed microorganism of claim 12 wherein said microorganism is a bacteria.

14. A transformed eukaryotic cell line comprising an expression vector for producing bacterial organophosphorus acid anhydrase wherein said vector has a cloned bacterial organophosphorus acid anhydrase gene fragment with the DNA coding sequence:

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CTGCAGCCTGACTCGGCACCAGTCGCTGCAAGGAGGTCGTAAGCAATCGCAAGGGGGGCAGC ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTG CTC GGC aet gin thr arg arg val val leu lys ser ala ala ala gly thr leu leu gly GGC CTG GCT GGG TGC GCG ACG TGG CTS GAT CGA TCG GCA CAG GCG ATC GGA TCA gly leu ala gly cys ala thr trp leu asp arg ser ala gln ala ile gly ser ATA COT GCG COT CCT ATC ACA ATC TOT GAA GCG GCT TTC ACA CTG ACT CAC GAG ile arg aia arg pro ile thr ile ser glu ala gly phe thr leu thr his glu GAC ATC TGC GGC AGC TCG GCA GGA TTC TTG COT GCT TGG CCA GAG TTC TTC GGT asp ile cys gly ser ser ala gly phe lau arg ala tTp pro glu phe phe gly AGC CGC AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala yal arg gly leu arg ala arg ala ala GGC STG CGA ACG ATT GTC GAT GTG TCG ACT TTC GAT ATC GGT CGC GAC GTC AGT gly val arg thr ile val asp val ser thr phe asp ile gly arg asp val ser TTA TTS GCC GAG GTT TCG CSG GCT SCC GAC GTT CAT ATC GTG GCG GCG ACC GGC lau lau ala giu val ser arg ala ala asp vai his ile val ala ala thr giy TTG TGG TTC GAC CCG CCA CTT 7CG ATG CGA TTG AGG TAT GTA GAG GAA CTC ACA leu trp pne asp pro pro leu ser met arg leu arg tyr val glu glu leu tar CAG TTC TTC CTG CGT GAG ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCG gla pne pne leu arg glu fle gla tyr gly ile glu asp thr gly ile arg ala GGC ATT ATC AAG GTC GCZ ACC ACA GGC AAG GCG ACC CCC TTT CAG GAG TTA GTG gly ile ile lys val axa thr thr gly lys ala thr pro phe gin glu leu val TTA ANG GCG GCC GCC CGG GCC AGC TTG GCC ACC GGT GTT CCG GTA ACC ACT CAC leu lys ala ala arg ala ser leu ala the gly val pro val the the his ACS SCA GCA AGT FAG CGC GAT GGT GAG CGA GGG AGG CGA TTT TTG AGT CGG ANG CTT GAG CTC TCA CGG GTT TGT ATT GGT CAC AGC GAT GAT ACT GAC GAT TTG lys lau glu pro ser arg wal dys ile gly his ser asp asp thr asp asp lau AGC TAT CTZ ACC GCC CTG CTG CGC GGA TAC CTC ATC GGT CTA GAC CAC ATC CCG ser tyr leu thr ala leu leu arg gly tyr leu ile gly leu asp his ile pro GCG ATT GGT CTA GAA GAT AAT GCS AGT GCA TCA CCS CTC CTG GGC ATC ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT FOG TOG CAA ACA COG GOT OTTO TTG ATO AAG GOG OTTO ATO GAC CAA GGC TAG arg/ser trp gin thr arg ala leu leu ile lys ala leu ile asp gin gly tyr ATC AAA CAA ATC CTC GTT TCG AAT GAC TGG CTG TTC GGG TTT TCG AGC TAT GTC ACT lys gin ile leu val ser asn asp trp leu phe gly phe ser ser tyr val ACC AAC ATC ATG GAC GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp val met asp arg val asn pro asp gly met ala pne ile CCA CTS AGA GTG ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ile pro pne tyr glu arg arg ala ser his arg lys arg cys CAG GCA TCA CTG TGA

gln ala ser leu .

ctalcosgogogogorororororoxocoalorogogororoxocoalorogoarocoaloroxocoalor 15. The transformed cell line of claim 14 wherein said cell line is derived from an insect. -

5 16. The transformed cell line of claim 15 wherein said insect is a Fall army worm caterpillar.

CTSCAGCCTSACTCSGCACCAGTCSCTSCAAGGAGAGTCSTAAGGAATCSGAAGGGGGGCAGG ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC SCA GGA ACT CTS CTC GGC Bet gin thr arg arg val val lau lys ser ala ala ala gy/ thij lau lau gly GGC CTS GGT GGG TGC GGS ACS TGG CTS GAT CGA TCG GCA AGG GGG ATC GGA TCA gly leu ala gly cys ala thr trp leu asp arg ser ala gln ala ile gly ser ATA CGT GGG CGT CCT ATC ACA ATC TGT GAA GGG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly pne thr leu thr his glu GAC ATC TGC GGC AGC TGG GCA GGA TTC TTG CGT TGG CCA GAG TTC TTC GGT asp ile cys gly ser ser ala gly phe lau arg ala trp pro glu phe phe gly AGC COC AAA GOT OTA GOG GAA AAG GOT GTG AGA GGA TTG CGC GCC AGA GCG GOT ser arg lys ala leu ala glu lys ala vai arg gly leu arg ala arg ala ala GGC STG CGA ACG ATT GTC GAT GTG TCG ACT TTC GAT ATC GGT CGC GAC GTC AGT gly val arg thr ile val asp val ser thr phe asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGC leu leu ala glu val ser arg ala ala asp val his ile val ala ala thr giy TTS TOG TTC GAC CCS CCA CTT TCS ATS COA TTS AGG TAT GTA GAG GAA CTC ACA leu trp pne asp pro pro leu ser met arg leu arg tyr val glu glu leu tar CAG TTC TTC CTG CGT GAG ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCG gin one one leu arg glu ile gin tyr gly ile giu aso thr gly ile arg ala GGC ATT ATC AND GTC GCS AGC ACA GGC AND GCS ACC GGG TTT CAG GAG TTA GTG gly ile ile lys val ala par thr gly lys ala thr pro pae gin glu leu val TTA ANG GOG GOG GOG GOG AGG TTG GOG AGG GOT GTT GOG GTA ACC AGT CAG leu lys ala ala ala ary ala ser leu ala the fly val pro val the the his ACG SCA SCA AGT CAG CSC SAT SGT GAG CSA SGC AGG CCA TTT TTS AGT CSS thr ala ala ser glm arg asp gly glu arg gly arg pro pro pne leu ser pro AND COT GAD COO TEA COO GOT TOT ATT GOT CAC AGG GAT GAT ACT GAC GAT TIG Lys law glw pro ser arg val cys ile gly his ser asp asp thr asp asp law AGO TAT OTO ACZ GOO OTG CTG CGC GGA TAG STO ATC GGT GTA GAC CAC ATC GGS ser tyr leu tyr ala leu lau arg gly tyr lau ile gly leu asp his ile pro CAC AGT GGG ATT GGT CTA GAA GAT AAT GGG AGT GGA TCA GGG GTG GTG GGC ATG his ser ale ile gly leu glu asp asn ala ser ale ser pro leu leu gly ile COT TOG TOG CAA ACA COG GOT CTC TTG ATC AAG GOG CTC ATC GAC CAA GGC TAC arg ser frp gin thr arg ala leu leu ile lys ala leu ile asp gin gly tyr ATG AAX CAA ATG CTG GTT TCG AAT GAC TGG CTG TTG GGG TTT TCG AGC TAT GTG net lys gin ile leu val ser asn asp trp leu phe gly pne ser ser tyr val ACC/AAC ATC ATG GAC GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asm ile met asp val met asp arg val asm pro asp gly met ala pne ile CCA CTG AGA GTG ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC /pro leu arg val ile pro phe tyr glu arg arg ala ser his arg lys arg cys GTGAACTGCAG

17. A transgenic eukaryotic organism comprising an expression vector for producing bacterial organophosphorus acid anhydrase wherein said vector has a cloned bacterial organophosphorus acid anhydrase gene fragment having the DNA coding sequence:

CTSCAGCCTSACTCGGCACCAGTCGCTGCAAGCAGAGTCGCAAGCAGTCGCAAGGGGGCCAGC ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTG CTC GGC met gin thr arg arg val val leu lys ser ala ala gly thr leu leu gly dge ers der des toe des acs tos ers dat esa tes dea das des ate soa tea gly leu ala gly cys ala thr trp leu asp arg ser sla gin ala ile gly ser ATA COT GCG COT CCT ATC ACA ATC TCT GAA GCG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly pae thr leu thr his glu GAC ATC TGC GGC AGC TGG GGA GGA TTC TTG GGT GGT asp ile cys gly ser ser ala gly pne lau arg ala TOG CON GNG THE THE GGT trp pro glu phe phe gly AGC COC AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala val arg gly leu arg ala arg ala ala GGC GTG CGA ACG ATT GTC GAT GTG TCG ACT TTC/GAT ATC GGT CGC GAC GTC AGT gly val arg thr ile val asp val ser thr phe asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCC ACC GGC leu leu ala glu val ser arg ala ala asp yai his ile val ala ala thr giy THE TOO THE GAC COS COA CTT TOO ATS COA TTO AGG TAT TA GAG GAA CTC ACA leu try one asp pro pro leu ser met ary leu ary tyr val glu glu leu tar leu try one asp pro pro léu ser met arq CAG THE THE CTS COT GAG ATT CAA TAT GGC ATC GAA GAC AGE GGA ATT AGG GCG gin one one leu arg glu ile gin tyr gly lie giu asp thr gly ile arg ala ANG GCT ACC CCC TT CNG GNG TTA GTG GGC ATT ATC ANG GTC GGS ACC ACA 5GC AAG GCA ACC GCC GIV ile ile lys vai ala thr thr gly lys ala thr pro/ TTA ANG GCG GCC GCC GCC AGC TTG GCC ACC GGT GTT GCG GTA ACC ACT CAC leu lys ala aia arg ala ser leu aia the gly yal pro val the the his ACC SCA GCA AGT CAG CGC GAT GGT CAG CGA GGC AGG CGA TTT TTG AGT CGG AND CTT GAG CCC TOA CGG GTT TGT ATT GGT CAC AGC GAT GAT ACT GAC GAT TTG lys lau glu pro ser arg val cys ile gly his ser asp asp thr asp asp leu AGC THE CTC ACC GCC CTG CTG CGC GGA THO CTC ATC GGT CTH GAC CHC ATC GCG ser tyr leu thr aid leu leu arg gly tyr /eu ile gly leu asp his ile pro CAC AGT GCG ATT GGT CTA GAA GAT AAT GCG AGT GCA TCA GCG CTG CTG GGC ATC his ser ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile cor ros res can aca cos cor ore res are and see ore are sac can ege the arg ser trp gin the arg/ala leu leu ile lys ala leu ile asp gin gly tyr ACC AAC ATC ATG GAC OTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp /val met asp arg val asn pro asp gly met ala pne ile CCA CTG AGA GTG ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ile pro phe tyr glu arg arg ala ser his arg lys arg cys CAG GCA TCA CTS TGA
gin ala ser leu
CTAACCCSGCCCGGTTCTGTGTCACCGACTTGCCGTGCATCACGCATCTTGGATCCTTCCACGCAGCSGCC
ACTATTCCCCGTTCAAGATACCGAACGATGAAGTCSGCATCGATAGGCATCTTCAATGTGATCAGGG
CTSCCACCTTCAAAGCCGGTGGCCACCCTGTCGATAGGTTTGAGGGACCGTTAAGCGACCGTGCTTTTC 18. A transgenic organism as claimed in claim 17 wherein said organism is derived from microinjection of said expression vector into drusophila melanogaster embryo cells.

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19. A transgenic organism as claimed in claim 17 wherein said organism is derived from injection of said expression vector into a Fall army worm caterpillar.

20. A method for making bacterial organophosphorus acid anhydrase, said method comprising:

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growing in a nutrient medium a transformed

microorganism having an expression vector with a

cloned bacterial organophosphorus acid anhydrase

gene fragment having the DNA coding sequence:

ATG CAA ACG AGA AGG GTT GTG GTC AAG TCT GCG GCC SCA GGA ACT GTG GTC GGC set gin thr arg arg val val leu lys ser ala ala gly thr leu leu gly GGC CTG GCT GGG TGC GCG ACG TGG CTG GAT CGA TCG GCA CAG GCG ATC GGA TCA gly leu ala gly cys ala thr trp leu asp arg ser a/a gin ala ile gly ser 5 ATA CGT GCG CGT CCT ATC ACA ATC TCT GAA GCG GGT /TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly pne thr leu thr his glu GAC ATC TGC GGC AGC TGG GGA GGA TTC TTG CGT GGT TGG CGA GAG TTC TTC GGT asp ile cys gly ser ser ala gly phe leu arg ala trp pro glu phe phe gly AGC CGC AAA GCT CTA GCG GAA AAG GCT GTG AGA/GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala val arg gly leu arg ala arg ala ala GGC STS CGA ACG ATT GTC GAT GTG TCG ACT TTC GAT ATC GGT CGC GAC STC AGT gly val arg thr ile val asp val ser thr she asp ile gly arg asp val ser 10 TTA TTG GCC GAG GTT TCG CGG GCT GCC GAG STT CAT ATC GTG GCG ACC GGC lau lau ala glu val ser arg ala ala asp val his ile val ala ala chr gly TTG TGG TTC GAC CCG CCA CTT T21 ATG CGA leu try pne asp pro pro leu ser net ary TIS AGG TAT GTA GAG GAA CTG ACA en arg tyr val gil glu leu tar CAG THE THE CTS COT GAG ATT CAA TAT GGC ATE GAA GAC ACE GGA ATT AGG GCG gla pne phe leu arg glu ile gla tyr gly ile glu asp thr gly ile arg ala one ATT ATC ANG GTC GCS ACC ACA GGC ANG GTS ACC CCC TTT CAG GAG TTA GTG gly ile ile lys val ala thr thr fly lys alla thr pro pne gfn glu leu val 15 ace ess see age the see act set see of all the the his TTA AAG GCG GCC leu lys ala ala ACS SEA GEA AGT CAG COC GAT GOT GAG CGA GGG AGG CCS CCA/ AND CTT GAG CCC TCA CCG GTT TGT ATT GGT CAC AGC GAT GAT ACT GAC GAT TTG lys lau glu pro ser arg val cys ile gly his ser asp asp thr asp asp lau AGG TAT CTG ACG GGG GTG CTG GGG GGA TAG CTG ATG GGT CTA GAC GAC ATG GGG ser tyr leu thr ala leu/leu arg gly tyr leu ile gly/leu asp his ile pro 20 CAC AGT GGG ATT GGT CTA GAA GAT AAT GGG AGT GGA TCA GGG CTG GGG ATG his ser ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT TOO TOO CAA ACA COO GOT CTO TTO ATC AAG GOO CTO ATC GAC CAA GOC TAC arg ser trp gin thr arg ala leu leu ile lys ala leu ile asp gin gly tyr ATG AAA CAA ATG CTC/GTT TCG AAT GAC TGG CTG TTC/GGG TTT TCG AGC TAT GTC dec lys gin ile lew val ser asm asp trp lew phe gly phe ser ser tyr val ACC AAC ATC ATG GÁC GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp val met asp arg val asn pro asp gly met ala pne ile 25 CCA CTG AGA GTG/ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val/ ile pro phe tyr glu arg arg ala ser his arg lys arg cys CCAAAGCCGGTGGCCACCCTGTCGATAGTCTTGAGGGACGGTAGCGACGACCGTGCT GTGAACTGCAG

allowing said microorganism to produce bacterial organophosphorus acid anhydrase; and

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recovering the bacterial organophosphorus acid /anhydrase.

21. A method for making bacterial organophosphorus acid anhydrase, said method comprising:

growing in a nutrient medium a transformed eukaryotic cell line comprising an expression vector with a cloned bacterial organophosphorus acid anhydrase gene fragment having the DNA coding sequence:

CTGCAGCCTGACTCGGCACCAGTCGCTGCAAGCAGCTCGTAAGCAATCGCAAGGGGGCAGCATG CAA ACG AGA ACG GTT GTG CTC AAG TCT GCC GCC GCA GGA ACT CTG CTC GGC get gin the arg arg val val leu lys ser ala ala gly the leu lau gly GGC CTS GCT GGG TGC GCG ACG TGG CTS GAT CGA TCS GCA CAG GCS ATC GGA TCA gly leu ala gly cys ala thr trp leu asp arg ser ala gin ala ile gly ser ATA CST GCS CGT CCT ATC ACA ATC TCT GAA GCS GGT TTC ACA CTS ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly pne thr leu thr his glu GAC ATC TGS GGC AGC TGS GCA GGA TTC TG GGT AGC GAG TTC TG GGT asp ile cys gly ser ser ala gly pne leu arg ala trp pro glu pne pne gly AGC CGC AAA GCT CTA GCS GAA AAG GCT GTS AGA GGA TTG COC GCC AGA GCS GCT ser arg lys ala leu ala glu lys ala val arg gly leu arg ala ala arg ala ala GGC STG CGA ACG ATT GTC GAT GTG TCS ACT TTC GAT ATC GGT GGC GAC GTC AGT gly val arg thr ile val asp val ser thr phe asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG CGG GCT GCC GAC GTC ACC GGC leu leu ala gyu val ser arg ala ala ala asp val his ilé val ala ala thr gly TTG TGG TTC GAC CCG CCA GTT TCG ATG CGA TTG AGG TAT GTA GAG GAA CTC ACA leu try phe asp pro pro leu ser met arg leu arg tyr val glu glu leu tnr CAG TTC TTC CTG CGT GAG ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCG gln pne ghe leu arg qlu ile gin tyr gly ile gfu asp thr gly ile arg ala GGC ATT ARE AND GTC GCG ACC ACA GGC AND GCG ACC CCC TTT CAG GAG TTA GTG giy ile ile lys val ale thr thr gly lys ale thr pro pne gln glu leu val TTA ANG GEG GEG GEG GEG AGE TTG GEG AGE GET GET GEG GTA ACC ACT CAC leu lys ala ala ala arg ala ser leu ala thr gly val pro val thr thr his ACC SEA GOA ACT CAG COC GAT GOT GAG COA GOC AGG CCS CCA TIT TIG AGT CCS Chr ala ala ser gin arg asp gly glu arg gly arg pro pro phe leu ser pro AND CTT DAG COO TON COG GTT TOT ATT GGT CAC AGC GAT GAT ACT DAG GAT TTG lys lau gid pro ser arg val dys ile gly his ser asp asp thr asp asp lau AGO TAT OTO ÁCO GOO OTO CTO COO GOA TAO OTO ATO GOT OTA GAO CAO ATO COO ser tyr leu thr ala leu leu arg gly tyr leu ile gly leu asp his ile pro CAC AGT GGG ATT GGT CTA GAA GAT AAT GGG AGT GGA TCA CCG CTG GGG ATC his ser ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT TOO TOO CAA ACA COO GOT CTO TTO ATC AAG GOO CTO ATC GAC CAA GOO TAC arg ser/trp gln thr arg ala leu leu ile lys ala leu ile asp gln gly tyr ATG AAA CAA ATG CTG GTT TGG AAT GAC TGG CTG TTG GGG TTT TGG AGG TAT GTG dec lys gin ile leu val ser asn asp trp leu phe gly phe ser ser tyr val ACC AAC ATC ATG GAC GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp val met asp arg val asn pro asp gly met ala pne ile CCA CTG AGA GTG ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ile pro phe tyr glu arg arg ala ser his arg lys arg cys 

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allowing said microorganism to produce bacterial organophosphorus acid anhydrase; and

recovering the bacterial organophosphorus acid anhydrase.

22. A method for making bacterial organophosphorus acid anhydrase, said method comprising:

nourishing a transformed host in a nutrient medium allowing said host to produce bacterial organophosphorus acid anhydrase;

transforming host an expression vector comprising a DNA sequence coding for said bacterial organophosphorus acid anhydrase, and

separating the bacterial organophosphorus acid anhydrase from said host and said nutrient medium.

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23. The method for making bacterial organophosphorus acid anhydrase of claim 22 further comprising purifying said bacterial organophosphorus acid anhydrase.

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24. The method for making bacterial organophosphorus acid anhydrase of claim 22 wherein said host is a microorganism.

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25. The method for making bacterial organophosphorus acid anhydrase of claim 24 wherein said microorganism is a bacteria.

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26. The method for making bacterial organophosphorus acid anhydrase of claim 22 wherein said host is a eukaryotic cell line.

27. The method for making bacterial organophosphorus acid anhydrase of claim 26 wherein said eukaryotic cell line is derived from an insect.

28. The method for making bacterial organophosphorus acid anhydrase of claim 27 wherein said insect is a Fall army worm caterpillar.

- 29. The method of claim 22 wherein said anhydrase is purified to a level of approximately 3200 units/mg of anhydrase.
  - 30. The cloned bacter/ial organophosphorus acid anhydrase gene fragment of claim 1 where in the N-terminal sequence up to the start codon has been deleted from said DNA coding sequence.
  - 31. The expression vector of claim 6 wherein the N-terminal sequence up to the start codon has been deleted from said DNA coding sequence.
  - 32. The transformed microorganism of claim 12 wherein the N-terminal sequence up to the start codon has been deleted from said DNA coding sequence.
  - 33. The transformed eukaryotic cell line of claim 14 wherein the N-terminal sequence up to the start codon has been deleted from said DNA coding sequence.

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34. The transgenic eukaryotic organism of claim 17 wherein the N-terminal sequence up to the start codon has been deleted from said DNA coding sequence.

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- 35. The method for making bacterial organophosphorus acid anhydrase of claim 20 wherein the N-terminal sequence up to the start codon has been deleted from said DNA coding sequence.
- 36. The method for making bacterial organophosphorus acid anhydrase of claim 21 wherein the N-terminal sequence up to the start codon has been deleted from said DNA coding 15 sequence.
  - 37. The cloned bacterial organophosphorus acid anhydrase gene fragment of claim 1 wherein the C-terminal sequence has been deleted from Bam HI to PstI of Said DNA coding sequence.
- 38. The expression vector of claim 6 wherein the C25 terminal sequence has been deleted from Bam HI to PstI of said DNA coding sequence.
- 39. The transformed microorganism of claim 12 wherein the 30 C-terminal sequence has been deleted from <u>Bam</u> HI to <u>Pst</u>I of said DNA coding sequence.

40. The transformed eukaryotic cell line of claim 14 wherein the C-terminal seguence has been deleted from Bam HI to PstI of said DNA coding sequence.

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The transgenic eukaryotic organism of claim 17 41. wherein the C-terminal sequence has been deleted from Bam HI to PstI of said DNA coding sequence.

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The method for making bacterial organophosphorus acid anhydrase of claim 20 wherein the cterminal sequence has been deleted from Bam HI to PstI of said DNA coding sequence.

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43. The method for making bacterial organophosphorus acid anhydrase of claim 21 wherein the C-terminal sequence has been deleted from Bam HI to PstI of said DNA coding

sequence 20

44. Organophosphorus acid anhydrase produced by a genetically transformed host having an expression vector comprising a DNA sequence coding for said anhydrase. 25

The method of claim 44 wherein said anhydrase is characterized by  $K_{cat} = 2100 \text{ sec}^{-1}$  for paraoxon.

46. Bacterial organophosphorus acid anhydrase produced by a genetically transformed host having an expression vector comprising a cloned gene fragment with the DNA coding sequence:

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ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTC GTC GGC met gin thr arg arg val val leu lys ser ala ala gly thr leu leu gly GGC CTG GCT GGG TGC GCG ACG TGG CTG GAT CGA TCG GCA CAG GCG ATC GGA TCA gly leu ala gly cys ala thr trp leu asp arg ser ala gin ala ile gly ser ATA COT GCG COT CCT ATC ACA ATC TCT GAA GCG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly pne thr leu thr his glu GAC ATC TGG GGC AGC TGG GGA GGA TTC TTG GGT GGT TGG CGA GAG TTC TTG GGT asp ile cys gly ser ser ala gly phe leu and ala trp pro glu phe phe gly AGC CGC AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala val arg gly leu arg ala arg ala ala GGC GTG CGA ACG ATT GTC GAT GTG TCG ACT TTC GAT ATC GGT CGC GAC GTC AGT gly val arg thr ile val asp val ser thr phe asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGC leu leu ala glu val ser arg ala ala app val his ile val ala ala thr gly TTG TGG TTC GAC CCG CCA CTT TCG ATG CGA TTG AGG TAT GTA GAG GAA CTC ACA leu typ pne asp pro pro leu ser met ary leu arg tyr val glu glu leu tnr THE THE CTS COT GAG ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCS phe she leu arg glu ile gin tyr gly ile glu asp thr gly ile arg ala GGF ATT ATC ANG GTC GCG ACC ACA GGC ANG GCG ACC CCC TTT CAG GAG TTA GTG gly ile ile lys val ala thr thr gly lys ala thr pro phe gin glu leu val TTR ANG GOD GOD GOD GOD AGO TTG GOD ACC GOT GTT GOD GTA ACC ACT CAC lew lys ala ala arg ala ser lew ala the gly val pro val the the his ACS SEA SEA AST CAS COS GAT GOT GAG COA GGC AGG CCS CCA TIT TIG AGT CCS thr ala ala ser gin arg asp gly glu arg gly arg pro pro phe leu ser pro ANG CTT GAG CCC TCA CGG GTT TGT ATT GGT CAC AGC GAT GAT ACT GAC GAT TTG lys lau glu pro ser arg val dys ile gly his ser asp asp thr asp asp leu AGO TAT OTO AGO GOO GTS CTS CGC GGA TAG CTC ATC GGT CTA GAC CAC ATC CGS ser tyr leu thr ala leu leu arg gly tyr leu ile gly leu asp his ile pro CAC AGT GGG ATT GGT CTA GAA GAT AAT GGG AGT GGA TCA CCG CTG GGG ATC his ser ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT TOG TOG CAA ACA COG GOT CTC TTG ATC AAG GOG CTC ATC GAC CAA GGC TAC arg ser trp gin thr arg ala leu leu ile lys ala leu ile asp gin gly tyr ATG AAA CAA ATG CTC GTT TCG AAT GAC TGG CTG TTC GGG TTT TCG AGG TAT GTC nec lys gln ile leu val ser asn asp trp leu phe gly phe ser ser tyr val ACC AAC ATC ATG GAC GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp val met asp arg val asn pro asp gly met ala pne ile CCA CTG AGA GTG ATC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ile pro phe tyr glu arg arg ala ser his arg lys arg cys  $\frac{1}{2}$ CAG GCA TCA CTG TGA 

47. The bacterial organophosphorus acid anhydrase of claim 46 wherein the N-terminal sequence up to the start codon has been deleted from said DNA coding sequence.

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48. The bacterial organophosphorus acid anhydrase of claim 46 wherein the C-terminal sequence up to the start codon; has been deleted from <a href="mailto:Bam HI">Bam HI</a> to <a href="PstI">PstI</a> of said DNA coding sequence.

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49. The bacterial organophosphorus acid anhydrase of claim 46 wherein said host producing acid anhydrase is a microorganism.

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50. The backerial organophosphorus acid anhydrase of claim 46 wherein said host producing said anhydrase is a bacterial.

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51. The bacterial organophosphorus acid anhydrase of claim 46 wherein said host is a eukaryatic cell line.

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52. The bacterial organophosphorus acid anhydrase of claim 46 wherein said anhydrase is relatively pure, characterized by  $K_{cat} = 2100 \text{ sec}^{-1}$  for paraoxon.

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53. A method for detexifying an organophosphorus compound comprising exposing said compound to recombinant bacterial organophosphorus acid aphydrase.

- 54. The method of claim 53 wherein said exposure is accomplished by passing said compound through a matrix comprising said recombinant anhydrase
- 55. The method of claim 54 wherein said matrix is further comprised of a filtration device.
- 10 56. The method of claim 55 wherein said device is a gas mask.
- 57. The method of claim 53 wherein said organophosphorus 15 compound is in air.
  - 58. The method of claim 53 wherein said organophosphorus compound is in a fluid.
  - 59. The method of claim 53 wherein said exposure is accomplished by spraying said recombinant anhydrase on a locus comprising the organophosphorus compound.
  - 60. The method of claim 53 wherein said exposure is accomplished by introducing said anhydrase into a container comprising the organophosphorus compound.

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61. The method of claim 53 wherein said recombinant bacterial organophosphorus acid anhydrase is produced by a transformed microorganism comprising an expression vector for producing said anhydrase and wherein said vector has a cloned bacterial organophosphorus acid anhydrase gene fragment with the DNA coding sequence:

CTGCAGCCTGACTCCGCACCAGTCGCTGCAAGCAGCTCGTAAGCAATCGCAAGGGGGGCAGC ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTG CTC GGC met gin thr arg arg val val leu lys sar ala ala gly thr leu leu gly GGC CTG GGT GGG TGC GCG ACG TGG CTG GAT CGA TCG GCA CAG GCG ATC GGA TCA gly leu ala gly cys ala thr tro leu asp arg ser ala gln ala ile gly ser ATA CGT GCG CGT CCT ATC ACA ATC TCT GAA GCG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly pne thr leu thr his glu GAC ATC TGC GGC AGC TGS GCA GGA/TTG TTG CGT GCT TGG CCA GAG TTC TTC GGT asp ile cys gly ser ser ale gly phe lau arg ale trp pro glu phe phe gly AGC CGC AAA GCT TTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ale leu ale glu lys ale val arg gly eu arg ale arg ale ale ser arg lys ala leu ala glu lys ala val arg gly leu arg ala arg ala ala GGC GTG GGA ACG ATT GTC GAT GTG ACT TTC GAT ATC GGT CGC GAC GTC AGT gly val arg the ile val asp val ser per phe asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGC leu leu ala glu val ser arg ala ala asp val his ile val ala ala thr gly TTG TGG TTC GAC CCGA CTT FCG ATG CGA TTG AGG TAT GTA GAG GAA CTC ACA leu trp phe asp pro pro leu ser met arg leu arg tyr val glu glu leu thr CAG TTC TTC CTG CGT CAG ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCG gla phe phe leu arg gla ill gla, tyr gly ile glu asp thr gly ile arg ala GGC ATT ATC AAG GTC GGS AGC ACA GGC AAG GGS ACC CCC TTT CAG GAG TTA GTG gly ile ile lys val ala ar the gly lys ala the pro phe gln glu leu val TTA ANG GOG GOG GOG COG GOC AGO TTG GOC ACC GOT GTT COG GTA ACC ACT CAC law lys ala aia aia arg ala ser law aia thr gly vai pgo val thr thr his ACS SCA SCA AGT CAG CGC GAT GGT GAG CGA GGC AGG CCG CCA TTT TTG AGT CCG thr ala ala ser gin arg asp gly glu arg gly arg pro pro phe leu ser pro AAG CTT GAG CCC TCA CCG GTT TGT ATT GGT CAC AGG GAT GAT ACT GAC GAT TTG
lys lau glu pro ser arg val cys la gly his ser asp asp thr asp asp lau
agc tar cTC Acc Gcc cTG CTG CGC GGA TAC TC GGT CTA GAC CAC ATC CCG
ser tyr lau thr ala lau lau arg gly tyr lau ila gly lau asp his ila pro CAC AGT GCG ATT GGT FTA GAA GAT AAT GCG AGT GCA TCA CCG GTG CTG GGC ATC his ser ala ile gly leu glu app asp ala ser ala ser pro leu leu gly ile CGT TCG TGG CAA ACA CGG GCT FTC TTG ATC AAG GCG CTC ATC GAC CAA GGC TAC arg ser trp gln thr arg ala leu ile ilys ala leu ile asp gln gly tyr ATG AAA CAA ATG CTC GTT TCG AAT GAC TGG CTG TTC GGG TTT TCG AGC TAT GTC net lys gin ile leu vai ser asm asp trp leu phe gly phe ser ser tyr vai ACC AAC ATC ATG GA# GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp val met asp arg val asn pro asp gly met ala pne ile CCA CTG AGA GTG A/C CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ife pro phe tyr glu arg arg ala ser his arg lys arg cys 

62. The method of claim 53 wherein said recombinant bacterial organophosphorus acid anhydrase is produced by a transformed eukaryotic cell line comprising an expression vector for producing said anhydrase and wherein said vector has a cloned bacterial organophosphorus acid anhydrase gene fragment with the DNA coding sequence:

CTGCAGCCTGACTCGGCACCAGTCGCTGCAAGCAGAGTCGTAAGCAATCGCAAGGGGGCAGC ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTG CTC GGC met gin thr arg arg val val leu lys ser als/ala ala gly thr leu leu gly GGC CTG GGT GGG TGC GCG ACC TGG CTG GAT CGA TCG GCA CAG GCG ATC GGA TCA gly leu ala gly cys ala chr try leu asp arg ser ala gin ala ile gly ser ATA COT GCG COT CCT ATC ACA ATC TOT GAA GCG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ide ser glu ala gly phe thr leu thr his glu GAC ATC TG1 GGC AGC TCG GCA GGA TTC TTG CGT GCT TGG CCA GAG TTC TTC GGT asp ile cys gly ser ser ala gly phe len arg ala trp pro glu phe phe gly AGC CGU AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ser arg lys ala leu ala glu lys ala yal arg gly leu arg ala arg ala ala GGC STS CGA ACG ATT GTC GAT GTG TCG ACT THE GAT ATC GGT CGC GAC GTC AGT gly val arg thr ile val asp val ser the pne asp ile gly arg asp val ser TTA TTG GCC GAG GTT TCG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGC leu igu ala glu val ser arg ala ala asp val his ile val ala ala thr gly THE TGG TTC GAC CCG CCA CTT TCG ATG CGA TTG AGG TAT GTA GAG GAA CTC ACA leu trp pne asp pro pro leu ser net arg leu arg tyr val glu glu leu tnr cag TTC TTC CTG GAC ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCG gin pne pne leu arg glu ile gln tyr gly ile glu asp thr gly ile arg ala GGC ATT ATC AND GTG GGG ACC ACA GGC AAG GGG ACC CCC TTT CAG GAG TTA GTG
gly ile ile lya val ala the fire gly lys ala the pro phe gln glu leu val The ANG GCG GCG GCG GCC AGC TTG GCC ACC GGT GTT CCG GTA ACC ACT CAC law lys als als als arg als ser law as the gly val pro val the the his acc GCA GCA ACT CAC CGC GAT GGT GAG CGA GGC AGG CCG CCA TTT TTG AGT CCG the als als ser gil arg asp gly glw arg gly arg pro pro phe law ser pro ANG CTT GAG CCC TCA CGG GTT TGT ATT GGT CAC AGC GAT GAT ACT GAC GAT TTG lys lau glu pro ser arg val cys ile gly his ser asp asp thr asp asp lau AGG TAT CTC ACC GCC CTS CTG CGC GGA TAC CTC ATC GGT CTA GAC ACC ATC CGS ser tyr leu thr ala leu leu arg gly tyr leu ile gly leu asp his ile pro CAC AGT GGG ATT GGT CTA GAA GAT AAT GGG AGT GGA TCA CGG CTC CTG GGC ATC his ser ala ile gly leu glu asp asn ala ser ala ser pro leu leu gly ile COT TOG TOG CAA ACA COG GOT CTC TTG ATC AAG GCG CTC ATC GAC CAA GGC TAC arg ser trp gin the arg ala Yeu leu ile lys ala leu ile asp gin gly tyr ATG AAA CAA ATC CTC GTT TCG AAT GAC TGG CTG TTC GGG TTT TCG AGC TAT GTC net lys gin ile leu val ser aam asp trp leu pne gly pne ser ser tyr val ACC AAC ATC ATG GAC GTG ATG GAT COC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asn ile met asp val met asp and val asn pro asp gly met ala pne ile CCA CTG AGA GTG ATC CCA TTG TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ile pro pae tyr glu arg arg ala ser his arg lys arg cys GTGAACTGCAG

63. The method of claim 53 wherein said recombinant bacterial organophosphorus acid anhydrase is produced by a transgenic eukaryotic organism comprising an expression vector for producing said anhydrase wherein said vector has a cloned bacterial organophosphorus acid anhydrase gene fragment with the DNA coding sequence:

. AGCAGAGTCSTAAGCAATCSCAAGGGGGCAGC ATG CAA ACG AGA AGG GTT GTG CTC AAG TCT GCG GCC GCA GGA ACT CTC CTC GGC met gin thr arg arg val yal leu lys sgr ala ala ala gly thr leu leu gly GGC CTG GCT GGG TGC GCG ACG TGG CTG GAT CGA TCG GCA CAG GCG ATC GGA TCA gly leu ala gly cys ala thr pro leu asp arg ser ala glm ala ile gly ser GGC CTG GGT TGC GGG/ACG TGG CTG GAT CGA TCG GCA CAG GCG ATC GGA TCA gly leu ala gly cys ala thr pro leu asp arg ser ala gln ala ile gly ser ATA CGT GGC CGT CCT ATC ACA ATC TCT GAA GCG GGT TTC ACA CTG ACT CAC GAG ile arg ala arg pro ile thr ile ser glu ala gly one thr leu thr his glu GAC ATC TOC GGC AGC/TCG GCA GGA TCC TTG CGT GCT TGG CCA GAG TTC TTC GGT asp lie cys gly ser ser ala gly phe lau arg ala trp pro glu phe phe gly AGC CGC AAA GCT CTA GCG GAA AAG GCT GTG AGA GGA TTG CGC GCC AGA GCG GCT ger arg lys ala jeu ala glu lys aka val arg gly leu arg ala arg ala ala GGC STS CGA ACG ATT GTC GAT GTC TCG ACT TTC GAT ATC GGT CGC GAC STC AGT gly val arg the ile val asp vel ser the pne asp ile gly arg asp val ser TTA TTG GCC GAG GTT TEG CGG GCT GCC GAC GTT CAT ATC GTG GCG GCG ACC GGC leu leu ala glu val ser arg ala ala asp val his ile val ala ala the gly TTG TGG TTC GAC GCG CCA CTT TCG ATG CGA TTG AGG TAT GTA GAG GAA CTC ACA leu trp phe asp pro pro leu ser mer arg leu arg tyr val glu glu leu thr TAG THE THE OTS COT GAG ATT CAA TAT GGC ATC GAA GAC ACC GGA ATT AGG GCS GGC ATT ATC LAG GTC GCS ACC ACA GGC AAG GCS ACC GGC TTT CAG GAG TTA GTG gly ile ile ive val ala cur ung gly lys ala the pro pne gin glu leu val TTA AAG GCS GCC GCC GCC ACC TTS GCC ACC GGT GTT GCS GTA ACC ACT CAC law lys ala ala arg ala ser law ala thr gly val pro val thr thr his ACC GCA GCA AGT CAG CGC GAT GGT GAG GGA GGC AGG CCA TTT TTG AGT CCG AND CIT GAG CCC TAX GCG GIT TGT ATT GGT CAC AGC GAT GAT ACT GAG GAT TTG
LYS law glu pro set arg val cys ile gly his ser asp asp thr asp asp lew
AGC TAT CTC ACC GCC CTG CTG CGC GGA TAC CTC ATC GGT CTA GAC CAC ATC CGG
Ser Tyr lew thr ala lew lew arg gly cyr lew ile gly lew asp his ile pro CAC AGT GCG ATT GGT CTA GAA GAT AAT GCG AGT GCA TCA CCG CTG CGG ATC his ser ala ile gly led glu asp asn ala ser ala ser pro leu leu gly ile CST TGG TGG CAA AEA CGG GCT CTC TTG ATC AAG GGG CTC ATC GAC CAA GGC TAC arg ser typ gln thr arg ala leu leu ile lys ala leu ile asp gln gly tyr ATG AAA CAA ATC FTG GTT TGG AAT GAC TGG CTG TTG GGG TTT TGG AGC TAT GTC met lys gln ile leu val ser asn asp trp leu phe gly phe ser ser tyr val ACC AAC ATC ATG GAG GTG ATG GAT CGC GTG AAC CCC GAC GGG ATG GCC TTC ATT thr asm ile met asp wal met asp arg val asm pro asp gly met ala pne ile cox crs AGA GFG ARC CCX TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC CCA CTS AGA GTS ARC CCA TTC TAC GAG AGA AGG GCG TCC CAC AGG AAA CGC TGC pro leu arg val ile pro phe tyr glu arg arg ala ser his arg lys arg cys כאם פכא דכא לידה דכא gin ala ser leu .

CTAACCCGGCCFGGTTCTGTGTCACCGACTTGCCGTGCATGACGCATCTGGATCCTTCCACGCAGCGGCC

CTACCCGGCCFGGTTCTGTGTCACCGACTTGCCGTGCATGACGCATCTGGATCCTTCAATGTGATCAGGG 

64. A method of preventing poisoning of a locus by an organophosphorus compound by applying recombinant organophosphorus acid anhydrase to said locus before said compound contacts said locus.

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65. A method of detecting bacterial colonies capable of detoxifying organophosphorus acid anhydrides, comprising employing a transformed microorganism as a control in a plate assay wherein said microorganism is comprised of an expression vector for producing organophosphorus acid anhydrase and said vector is comprised of a cloned gene fragment containing the DNA coding sequence for the anhydrase.

- 66. The method of claim 65 wherein said anhydrides comprise a pesticide and said plate assay is conducted prior to applying said pesticide to soil to quantitate the number of microorganisms capable of detoxifying said pesticides in said soil.
- 25 67. A method for protecting insects from organophosphorus compounds comprising feeding said insects recombinant organophosphorus acid anhydrase.
- 30 68. A method for protecting insects from organophosphorus compounds comprising infecting insects with microorganisms comprised of an expression vector for producing an organophosphorus acid anhydrase wherein said vector is comprised of a cloned gene fragment containing the DNA coding sequence for the anhydrase.

- 69. A method for protecting insects from organophosphorus compounds comprising introducing into the environment of said insects microorganisms comprised of an expression vector for producing an organophosphorus acid anhydrase wherein said vector is comprised of a cloned gene fragment containing the DNA coding sequence of the anhydrase.
- 70. A pesticide comprising an organophosphorus compound 10 and an inhibitor of bacterial organophosphorus acid anhydrase.

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